WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

a semiconductor substrate having a first main surface and a second main surface opposite to said first main surface; and

a semiconductor element formed on said first main surface of said semiconductor substrate,

wherein a recessed portion is provided on said second main surface of said semiconductor substrate;

a convex portion functioning as a solid immersion lens and having a partial spherical surface is provided on a bottom surface of said recessed portion; and

an angle $\theta 1$ formed between a side surface of said recessed portion and said second main surface is larger than 90°.

2. The semiconductor device according to claim 1, wherein said angle $\theta 1$ satisfies the following relationship

$$\theta 1 \geqq 90° + \theta 2$$

where $\theta 2$ represents a half angle of a converging angle of an objective lens provided at the same side as said second main surface with a predetermined distance from said semiconductor substrate when said semiconductor device is analyzed by utilizing said convex portion as the solid immersion lens under a given optical means.

3. The semiconductor device according to claim 1, wherein said angle $\theta 1$ is equal to or larger than 106°.

4. A method for machining a semiconductor substrate comprising the steps of:

(a) preparing a semiconductor substrate; and

(b) machining said semiconductor substrate from its main surface by using a single point tool to form a convex portion functioning as a solid immersion lens and having a partial spherical surface,

wherein a first angle formed between a machined side surface resulting from the machining operation applied to said semiconductor substrate in said step (b) and said main surface of said semiconductor substrate is larger than 90°,

a cutting part of said single point tool has a tip and a cutting edge, said cutting edge extending from said tip with a predetermined length so as to form a second angle between a central axis of said single point tool and said cutting edge, and

said second angle is equal to a value obtained by subtracting 90° from said first angle.

5. The method for machining a semiconductor substrate according to claim 4, wherein a tip radius of said cutting part of said single point tool is less than 22% of a thickness of said semiconductor substrate.